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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

INVENTOR(S)		
Given Name (first and middle (if any))	Family Name or Surname	Residence (City and either State or Foreign Country)
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☐ *Additional inventors are being named on the_____ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

PACKAGE ALIGNMENT SYSTEM FOR A CONVEYER

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☒ Specification *Number of Pages*	8	☐ CD(s), Number	
☒ Drawing(s) *Number of Sheets*	4	☐ Other (specify)	
☐ Application Data Sheet. See 37 CFR 1.76			

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Respectfully submitted,

SIGNATURE [signature] Date 03/05/04

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TITLE OF THE INVENTION

[001] PACKAGE ALIGNMENT SYSTEM FOR A CONVEYER

BRIEF DESCRIPTION OF THE DRAWINGS

[002] Figure 1 is a top view of a package alignment system for a conveyor in accordance with an illustrative embodiment of the present invention;

[003] Figure 2 is a side view along 2-2 of the package alignment system for a conveyor disclosed in Figure 1;

[004] Figure 3 is a detailed top view of the package alignment system for a conveyor disclosed in Figure 1; and

[005] Figure 4 is a side view of a package alignment system for a conveyor in accordance with an alternative illustrative embodiment of the present invention.

DETAILED DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENTS

[006] Referring to Figure 1, the package alignment system, generally referred to using the reference numeral 10, is comprised of a conveyor belt 12 on which are transported the articles as in 14 to be rotated. The conveyor belt 12 conveys the articles 14 into a gap between a first moving belt 16 and a second moving belt 18, the belts typically being manufactured from a robust pliable material such as rubber, urethane or neoprene reinforced with fibreglass, Kevlar®, or the like. In the region of the gap, the first moving belt 16 and the second moving belt 18 follow parallel paths that are at substantially the same height above and parallel to the conveyor belt 12, such that items, while being conveyed through the gap, travel between and in the

same direction as the moving belts 16 and 18.

[007] The articles as in 14 being conveyed on the conveyor belt 12 can be of a variety of shapes, however in the disclosed embodiment the articles are of similar shapes and include a neck portion 20 having a substantially cylindrical shape. Referring to Figure 2, the package alignment system 10 is adjusted such that the first moving belt 16 and the second moving belt 18 are level with the neck portion 20.

[008] The first moving belt 16 and the second moving belt 18 travel at different speeds, typically with one of the moving belts (in the case at hand the second moving belt 18) travelling faster than the conveyor belt 12 and the other moving belt (in the case at hand the first moving belt 16) travelling slower than the conveyor belt 12. Therefore, if the neck portion 20 of an article as in 14 is pressed between the first moving belt 16 and the second moving belt 18, a rotating force will be brought to bear on the neck portion 20 thereby causing the article to rotate around a point P which moves with the conveyor belt 12. However, in order to cause an article as in 14 to rotate in this manner, it is necessary that the force which is brought to bear on the neck portion 20 by the outer surfaces of the first moving belt 16 and the second moving belt 18 is sufficient to overcome both the friction between the lower surface 22 of the article 14 and the conveying surface 24 of the conveyor belt 12 as well as the inertia of the article 14. In this regard, and referring back to Figure 1, the distance W between the opposing surfaces of the first moving belt 16 and the second moving belt 18 is initially adjusted to form a gap that is as narrow as possible while allowing containers to progress through it without coming in contact with either of said belts when all pressure pads 30 are retracted.

[009] In other words, in order to turn an article as in 14 it is necessary to apply behind one of the moving belts 16 and 18 in the region where the article to be rotated is located, a force sufficient to press this article against the other

belt and produce enough friction between the article and the two belts to overcome the friction between the article and the conveying surface 12 and induce rotation about point P. Furthermore, by applying such pressure over only a certain proportion of the length of the gap between belts 16 and 18, a proportionally varying angle of rotation may be obtained for a given article. In order to do this, the package alignment system 10 is equipped with a series of pistons as in 26.

[010] Referring to Figure 3, each piston 26 is attached via a piston rod 28 to a pressure pad 30, the pressure pad 30 manufactured from a rigid material such as UHMW polyethylene, nylon or the like. The piston rod 28 may be extended to move the pressure pad 30 to its extended pressure applying position by applying compressed air to the piston 26 via an air hose 32. As will now be understood by a person of ordinary skill in the art, by extending the pressure pad 30 via the piston rod 28, the distance W between the first moving belt 16 and the second moving belt 18 can be reduced in the region of the pressure pad 30 such that pressure is brought to bear on the neck portion 20 of an article 14, thereby causing the neck portion 20 to rotate. In this regard, lateral movement of the second moving belt 18 away from the first moving belt 16 can be limited by the provision of a retaining surface 34. Alternatively, the retaining surface 34 could be replaced by a series of pistons, piston rods and pressure pads (all not shown) for moving the first moving belt 16 towards the second moving belt 18.

[011] Note that although the present illustrative embodiment makes reference to pistons driven by compressed air, other actuators, for example those driven by hydraulic fluid or solenoids, could also be used in a given implementation.

[012] When the supply of compressed air to the piston 26 is reversed (or shut off if the piston 26 is biased using a spring or the like to return the piston

rod 28 to the retracted position), the piston rod 28 retracts and the pressure pad 30 returns to the non-extended position, thereby relieving the pressure exerted on the article as in 14 by the first moving belt 16 and the second moving belt 18 in the region of the pressure pad 30.

[013] Referring back to Figure 1, a micro-controller 36 is used to control the valves 38 which supply compressed air to the pistons 26 via their respective air hoses as in 32. Inputs to the micro-controller 36 include:

- The speed of the conveyor belt 12;
- a discrete signal from a sensor 40 located at a known distance upstream of the alignment system 10 detecting the presence at that location of articles on conveyor belt 12;
- pulses generated by a device known as an encoder (not shown), each pulse corresponding to a known displacement of the conveyor belt 12.
- A signal or a combination of signals from one or several second sensors (not shown) located close to sensor 40 that can be interpreted to by the micro-controller 36 to determine the orientation of an article at the moment it is detected by sensor 40.

[014] The micro-controller 36 would typically process these inputs as follows:

- The required speeds for belts 16 and 18 are calculated as that of belt 12 plus a certain percentage for the faster one of belts 16 and 18, and minus the same percentage for the slower one. Adding and subtracting the same percentage ensures that products that rotate do so while moving at the same speed as belt 12;
- for each pulse that is generated by the encoder, a value of 0 or 1 is memorized by the micro-controller. A value of 1 is memorized if the

detection by sensor 40 and the second sensor(s) (not shown) of an article to be rotated coincides with the reception of a pulse from the encoder, otherwise a value of 0 is memorized. The N most recent such values are kept in the micro-controller's memory in the order in which they are generated, forming a string of zeroes and ones known as a shift register. This shift register is an exact representation of the positions of the articles to be rotated on a section of conveyor 12 whose length is N times the distance that is known to correspond to an encoder pulse, and which starts where sensor 40 is located;

- the length N covered by the shift register must be at least sufficient to track the position of the articles until they exit the gap between belts 16 and 18;
- the distance corresponding to consecutive pulses being known as well as the position of sensor 40, it is easy to associate each pressure pad 30 with one or more consecutive positions in the shift register. A value of 1 at any one of these positions signals the presence of a product that needs to be rotated in front of the corresponding pressure pad; and
- for each pressure pad 30, the micro-controller continuously monitors the values at the positions associated with it in the shift register and, if it is wished to rotate that article, sends a signal to the corresponding valve 38 whenever a value of 1 is present at that position.

[015] Additionally, with provision of an appropriate sensor or sensors, such as optic or ultrasonic detectors, video cameras and the like, the orientation of the article to be rotated can also be determined and provided to the micro-controller 36. This would allow, for example, the micro-controller 36 to control rotation such that certain articles would be rotated more than others, while other articles would not be rotated at all.

[016] It follows from the above that articles that need to be rotated progress through the gap between the belts 16 and 18 in a narrow pressure zone that accompanies them. This pressure zone is created by the successive activation of pressure pads 30 by the micro-controller 36 (via corresponding valves 38 and tubes 32) synchronous with the progress of the articles as in 14 through the gap. The ability to apply pressure only where it is needed allows the alignment system 10 to simultaneously handle articles that need to be rotated and others that do not.

[017] When two articles are rotated simultaneously, the moving belts 16, 18 come in contact with both rotating articles as the belts are pressed against the articles by the pressure pads 30. Between these articles, the moving belts 16, 18 follow parallel paths, forming a gap whose width is equal to or slightly less than the diameter of an article. If an article that must not be rotated is located between two rotating articles, the moving belts 16, 18 will necessarily come in contact with this article. In order to prevent rotation of this article, the surface of the moving belts 16, 18 that is in contact with the articles must be made of a material that will not produce enough friction to induce rotation of an article when the belts contact this article without being pressed against it by one of the pressure pads 30.

[018] Still referring to Figure 1, as stated above, in order to rotate an article located in the gap between the moving belts 16, 18, the pressure exerted on the neck portion of the article must be sufficient to overcome friction and inertia. In some cases, for example when the articles to be rotated are empty and manufactured from a light material such as PET, the pressure required to overcome the frictional and inertial forces and rotate the article is minimal. In such cases, even light pressure exerted on the neck portion 20 of an article 14 can cause the article to rotate. In some cases, given the relatively narrow gap between the moving belts 16, 18, the neck portion 20 of an article 14 may

inadvertently strike one or other of the moving belts 16, 18. In some cases this may lead to the article being inadvertently rotated or cause the article to fall over, fouling the conveyor belt 12 and requiring action on behalf of an operator to clear the foul.

[019] Referring now to Figure 4, an alternative illustrative embodiment of a package alignment system 10 in accordance with present invention will be described. In order to ensure that light articles are not inadvertently rotated or knocked over, a third moving belt 42 and a second series of pneumatic pistons as in 44 for applying a vertical pressure to the articles as in 14 is provided. Each piston as in 44 is attached to a pressure pad 46 via a piston 48. The pistons as in 44 are attached to a controlled source of compressed air via a series of hoses 50. The micro-controller 36 controls a series of valves 52 which, when activated, actuate the pistons causing the piston rods 48, and thus the pressure pads 46, to move from their retracted to extended positions. On deactivation of the valve(s) 52, the piston rods 48, and thus the pressure pads 46, will return to their retracted positions.

[020] Still referring to Figure 4, the third moving belt 42 is oriented such that its outer surface 54 is opposite the conveying surface 24 of the conveyor belt 12 at least within the gap between the first moving belt 16 and the second moving belt 18. The speed of the third moving belt 42 is also adjusted such that the outer surface 54 travels at the same speed as the conveyor belt 12. Provided the distance H between the outer surface 54 of the conveying surface 24 is correctly adjusted, actuation of a particular piston as in 44_1, 44_2, and 44_3 when an article as in 14_1 is located directly below the piston as in 44_1, 44_2, and 44_3 will cause the outer surface 54 of the third moving belt 42 to exert a vertical pressure on the article 14_1, thereby preventing the article 14_1 from being inadvertently rotated or from falling over. By controlling the actuation of successive pistons as in 44 to correspond with the speed of the article 14, the exertion of vertical pressure on a particular article as in 14 can

be made to follow the article 14 as it moves with the conveyor belt 12.

[021] Referring back to Figure 3, in an alternative illustrative embodiment, in order to reduce contact between the second moving belt 18 and articles 14 where turning is not desired, a magnet as in 56 is introduced into each of the pressure pads as in 30. Additionally, the second moving belt 18 is manufactured to include a ferrous material such as steel, for example a steel mesh or wire. Persons of ordinary skill in the art will appreciate that the second moving belt 18 will be attracted towards the magnets as in 56, and therefore the pressure pads as in 30. As a result, when the pressure pads as in 30 are retracted, the second moving belt 18 will follow to some degree the pressure pads as in 30, thereby reducing any potential pressure which may otherwise be applied to the neck 20 of an article 14 located adjacent that particular pressure pad 30.

[022] It is to be understood that the invention is not limited in its application to the details of construction and parts illustrated in the accompanying drawings and described hereinabove. The invention is capable of other embodiments and of being practised in various ways. It is also to be understood that the phraseology or terminology used herein is for the purpose of description and not limitation. Hence, although the present invention has been described hereinabove by way of preferred embodiments thereof, it can be modified, without departing from the spirit, scope and nature of the subject invention as defined in the appended claims.

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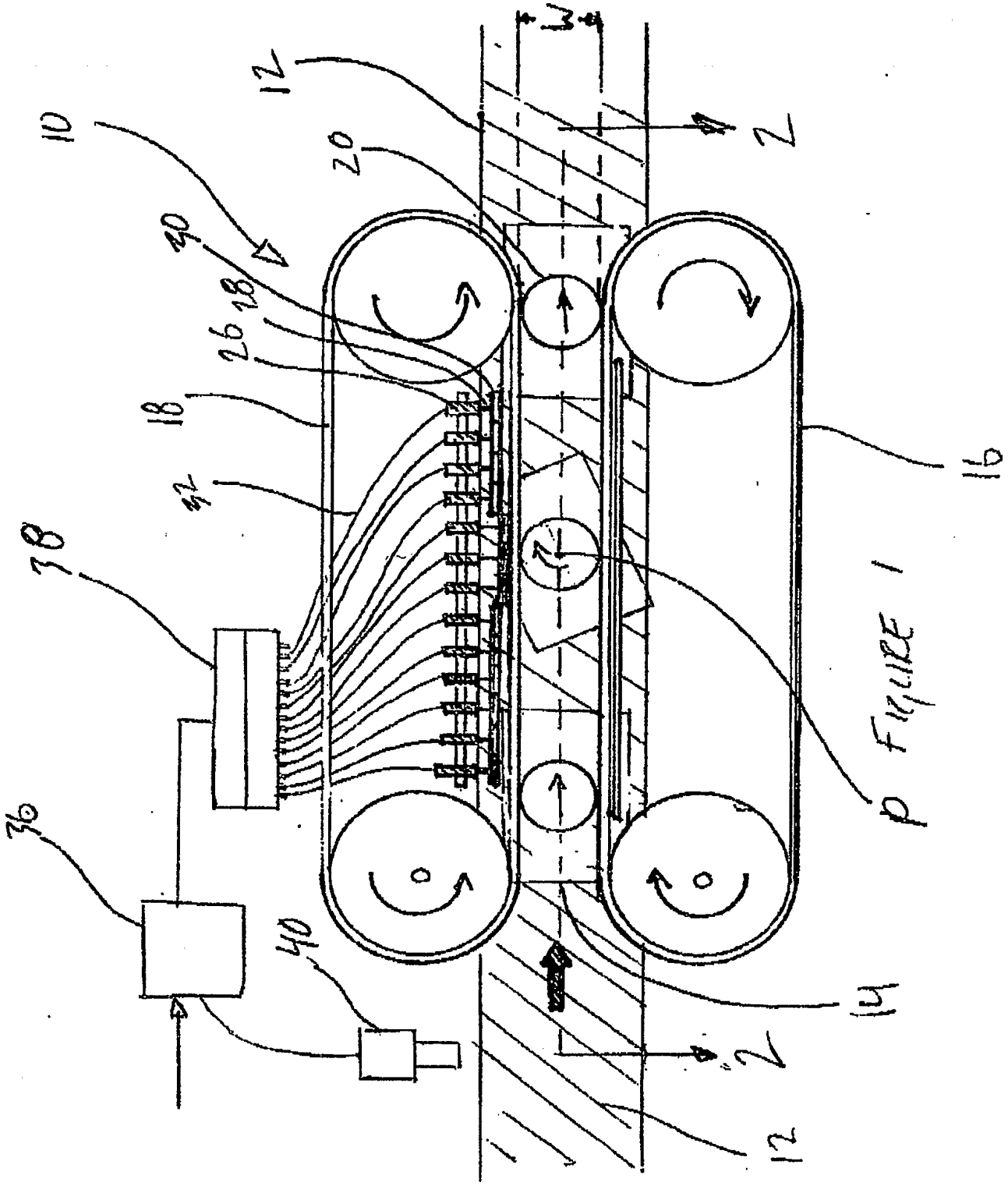

FIGURE 1

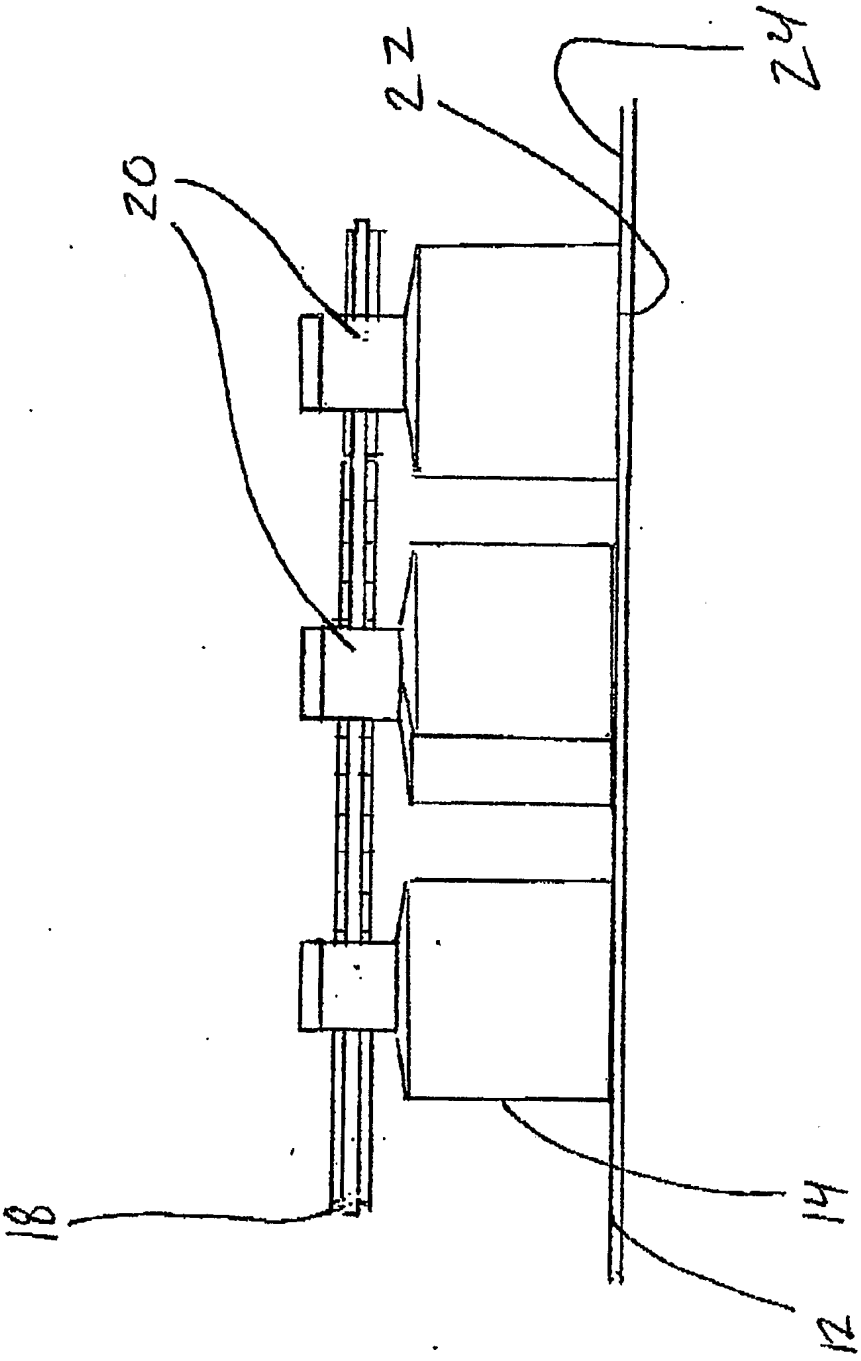

FIGURE 2

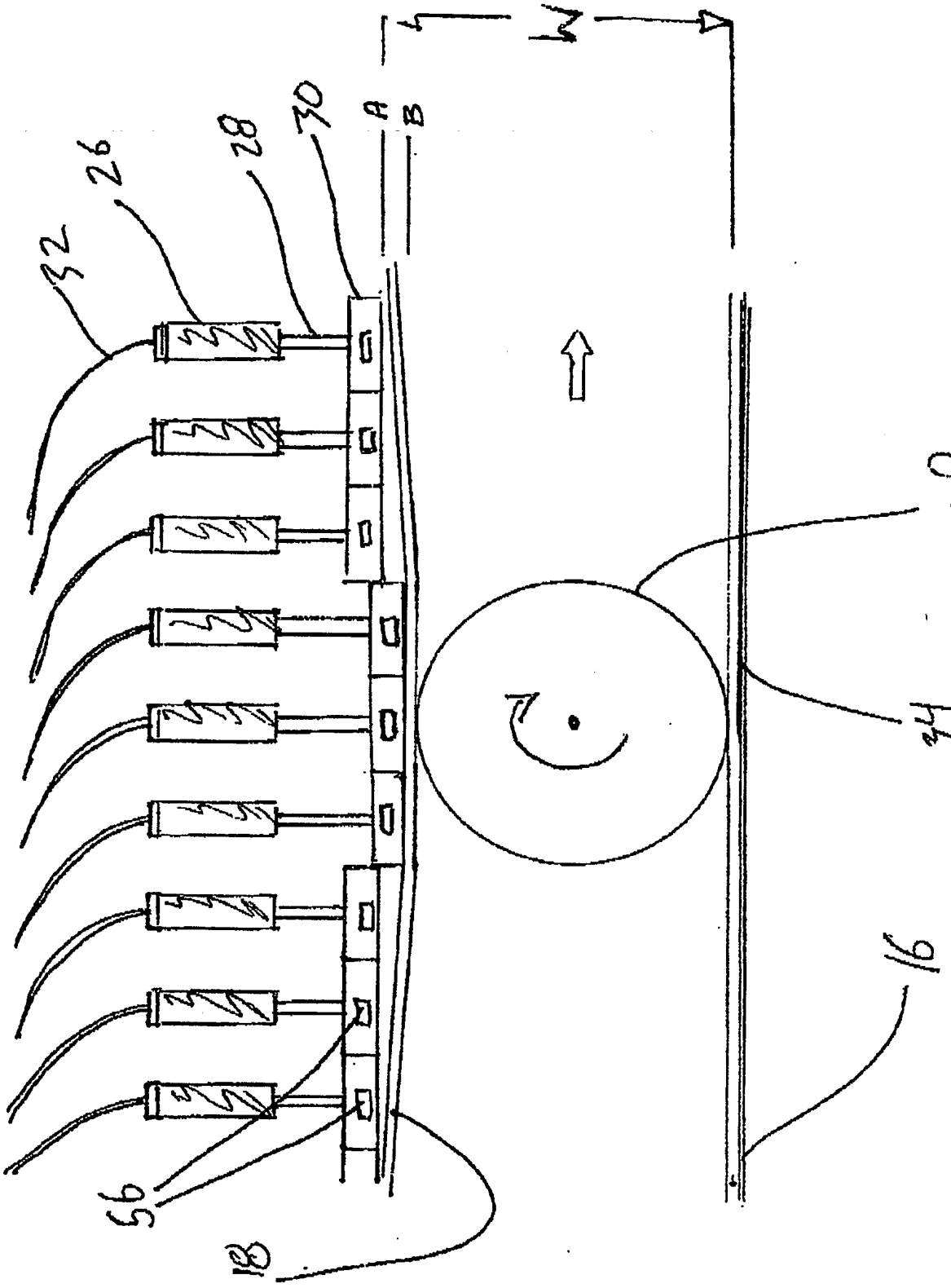

FIGURE 3

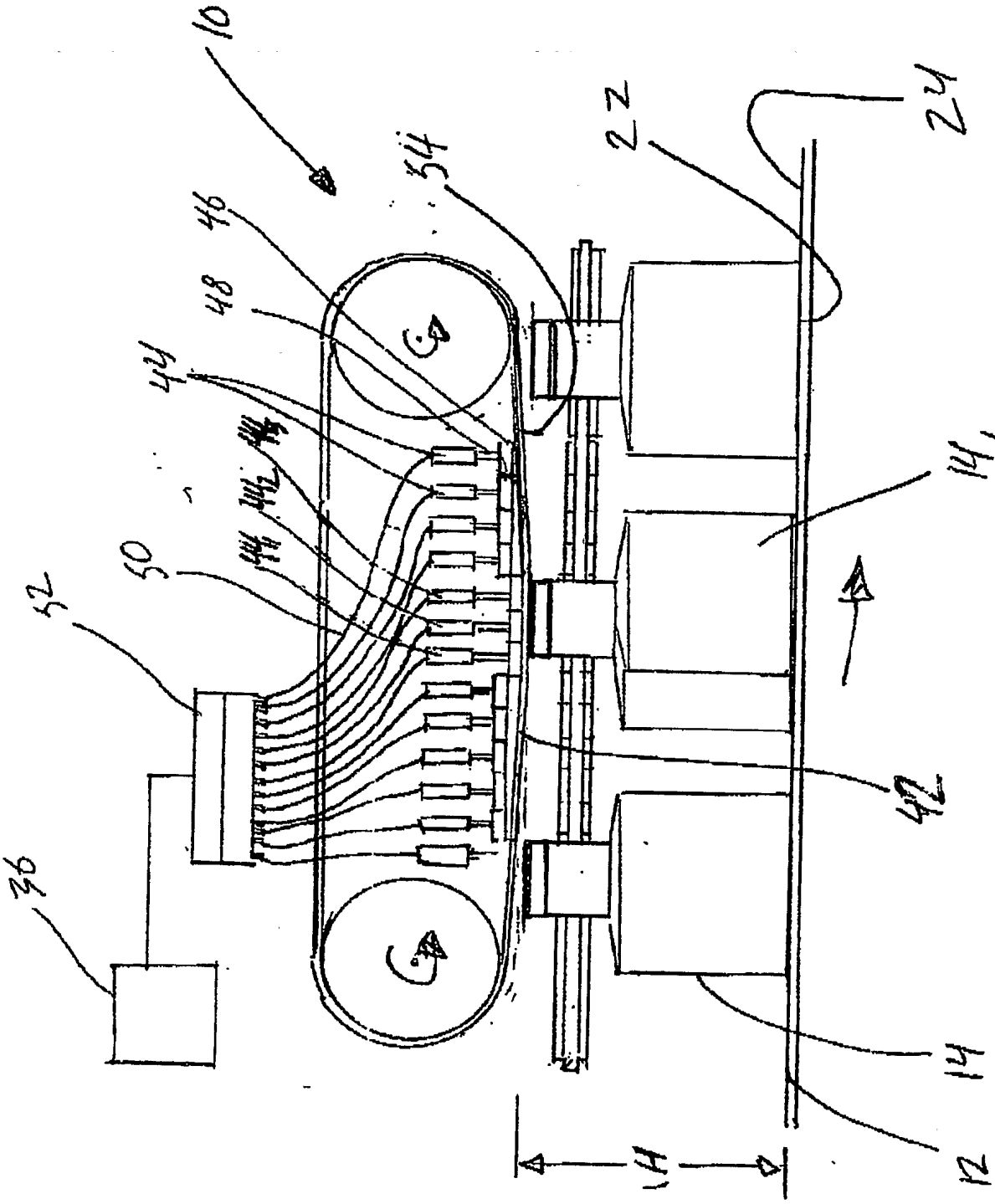

FIGURE 4